



LISTING OF CLAIMS

1. (currently amended) A method for ultrasonically detecting vibration of a target, comprising the steps of:

causing a stream of a fluid to flow to the target from an outlet in a chamber containing the fluid to the target;

providing an ultrasonic carrier beam of a predetermined frequency in the fluid by means of a first transducer in contact with the fluid in the chamber, said carrier beam being propagated along the fluid stream to the target;

converting a reflected ultrasonic beam to a return electrical signal by means of the first transducer or a second transducer in contact with the fluid in the chamber; and

demodulating the return electrical signal so as to provide a measure of a vibrational characteristic of the target;

measuring a noise signal produced by vibration of at least one of said transducers;

and

canceling the noise signal from the return electrical signal.

2. (cancelled)

3. (cancelled)

4. (original) The method of Claim 1, wherein the target comprises a cutting tool or a workpiece.

5. (original) The method of Claim 1, wherein the ultrasonic carrier beam is a focused ultrasonic beam.

6. (original) The method of Claim 1, wherein the predetermined frequency is between 100 kHz and 10 MHz.

7. (original) The method of Claim 1, wherein the ultrasonic carrier beam is a continuous ultrasonic beam.

8. (cancelled)

9. (original) The method of Claim 1, wherein the vibrational characteristic is selected from the group consisting of surface displacement and surface velocity.

10. (original) The method of Claim 1, further comprising the step of:
introducing an electrical time delay into the signal path via analog electronic means
or via a separate ultrasonic delay line,
whereby a signal enhancement is provided.

11. (original) The method of Claim 1, further comprising the step of:
calibrating the vibrational characteristic of the target by means of a phase
modulator or a frequency modulator.

12. (currently amended) A device for ultrasonically detecting vibration of a target,
comprising:
a fluid;
a chamber containing the fluid and having an outlet through which a stream of the
fluid is caused to flow from the chamber to the target;
a fluid source in fluid communication with said chamber;
a means for causing the fluid to flow from said fluid source through said chamber

to the target;

a driver for providing an electrical signal of a predetermined frequency;

a transducer in contact with the fluid in the chamber and driven by said driver to generate an ultrasonic carrier beam that is propagated along the stream of the fluid to the target, wherein said transducer also detects a reflected ultrasonic beam from the target and generates a return electrical signal;

a directional coupler, disposed between said driver and said transducer;

a contact accelerometer for detecting vibration of said transducer; and

a demodulator for processing the return electrical signal so as to provide a measure of a vibrational characteristic of the target.

13. (cancelled)

14. (original) The device of Claim 12, further comprising a baffle within said chamber for providing laminar flow of the fluid.

15. (cancelled)

16. (original) The device of Claim 12, further comprising a confinement tube for the stream of the fluid.

17. (original) The device of Claim 12, further comprising a protective tube for the stream of the fluid.

18. (currently amended) ~~The device of Claim 12, further comprising~~ A device for ultrasonically detecting vibration of a target, comprising:

a fluid;

a chamber containing the fluid and having an outlet through which a stream of the fluid is caused to flow from the chamber to the target;

a fluid source in fluid communication with said chamber;

a means for causing the fluid to flow from said fluid source through said chamber to the target;

a driver for providing an electrical signal of a predetermined frequency;

a transducer in contact with the fluid in the chamber and driven by said driver to generate an ultrasonic carrier beam that is propagated along the stream of the fluid to the target, wherein said transducer also detects a reflected ultrasonic beam from the target and generates a return electrical signal;

a directional coupler, disposed between said driver and said transducer;

a demodulator for processing the return electrical signal so as to provide a measure of a vibrational characteristic of the target; and

a phase modulator or a frequency modulator for calibrating the demodulator.

19. (currently amended) A device for ultrasonically detecting vibration of a target, comprising:

a fluid;

a chamber containing the fluid and having an outlet through which a stream of the fluid is caused to flow from the chamber to the target;

a fluid source in fluid communication with said chamber;

a means for causing the fluid to flow from said fluid source through said chamber to the target;

a driver for providing an electrical signal of a predetermined frequency;

a first transducer in contact with the fluid in the chamber and driven by said driver to generate an ultrasonic carrier beam that is propagated along the stream of the fluid to the target;

a second transducer that detects a reflected ultrasonic beam from the target and generates a return electrical signal; ~~and~~

a demodulator for processing the return electrical signal so as to provide a measure of a vibrational characteristic of the target; and

a contact accelerometer for detecting vibration of said transducer.

20. (cancelled)

21. (original) The device of Claim 19, further comprising a baffle within said chamber for providing laminar flow of the fluid.

22. (cancelled)

23. (original) The device of Claim 19, further comprising a confinement tube for the stream of the fluid.

24. (original) The device of Claim 19, further comprising a protective tube for the stream of the fluid.

25. (currently amended) ~~The device of Claim 19, further comprising~~ A device for ultrasonically detecting vibration of a target, comprising:

a fluid;

a chamber containing the fluid and having an outlet through which a stream of the fluid is caused to flow from the chamber to the target;

a fluid source in fluid communication with said chamber;

a means for causing the fluid to flow from said fluid source through said chamber to the target;

a driver for providing an electrical signal of a predetermined frequency;

a first transducer in contact with the fluid in the chamber and driven by said driver to generate an ultrasonic carrier beam that is propagated along the stream of the fluid to the target;

a second transducer that detects a reflected ultrasonic beam from the target and generates a return electrical signal;

a demodulator for processing the return electrical signal so as to provide a measure of a vibrational characteristic of the target; and

a phase modulator or a frequency modulator for calibrating the demodulator.

26. (cancelled)